



Coimisiún na Scrúduithe Stáit State Examinations Commission

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Bitheolaíocht

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Ardleibhéal

Marking Scheme
Biology

Leaving Certificate Examination, 2007
Higher Level

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State Examinations Commission**

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Biology – Higher Level

Marking Scheme

Introduction

The marking scheme is a guide to awarding marks to candidates' answers. It is a concise and summarised guide and is constructed in a way to minimise its word content.

Assistant Examiners must conform to this scheme and may not allow marks for answering outside this scheme.

The scheme contains key words or phrases for which candidates may be awarded marks. This does not preclude synonyms or phrases which convey the same meaning as the answer in the marking scheme. Although synonyms are generally acceptable, there may be instances where the scheme demands an exact scientific term and will not accept equivalent non-scientific or colloquial terms.

The scheme may include the words "any valid answer" and the Assistant Examiner will use his/her professional judgement to determine the validity of the answer. If in doubt, he/she should consult with his/her Advising Examiner before awarding marks.

Where it comes to the attention of the Assistant Examiner that a candidate has presented a valid answer and there is no provision in the scheme for accepting this answer, then he/she must first consult with his/her Advising Examiner before awarding marks.

A key word may be awarded marks, only if it is presented in the correct context.

e.g. Question: Briefly outline how water from the soil reaches the leaf.

Marking scheme - concentration gradient / root hair / osmosis / cell to cell / root pressure/ xylem / cohesion **or** explained / adhesion **or** capillarity **or** explained / Dixon and Joly / transpiration **or** evaporation [*accept water loss*] / tension any six **6(3)**

Answer " Water is drawn up the xylem by osmosis" Although the candidate has presented two key terms (xylem, osmosis), the statement is incorrect and the candidate can only be awarded 3 marks for referring to the movement of water through the xylem.

Cancelled Answers

The following is an extract from S63 *Instructions to Assistant Examiners*

"Where a candidate answers a question or part of a question **once only** and then cancels his/her answer, you should ignore the cancelling and should treat the answer as if it had been left uncanceled."

e.g.

Question: What is pollination?

Marking Scheme: transfer of pollen/ from anther/ to stigma **3(3) marks**

Sample Answer: ~~transfer of pollen/ from anther/ to stigma~~

The candidate has cancelled the answer and has not made another attempt to answer the question and may be awarded 3(3) marks.

Sample Answer: ~~transfer of pollen/ by insect/ to stigma~~

The candidate has cancelled the answer and has not made another attempt to answer the question and may be awarded 2(3) marks.

Surplus Answers

In Section A a surplus wrong answer cancels the marks awarded for a correct answer.

e.g.

Question: The walls of xylem vessels are reinforced with

Marking Scheme: lignin **4 marks**

Sample answers:

chitin, lignin – there is a surplus answer, which is incorrect, therefore the candidate scores 4 – 4 marks = 0.

~~lignin~~ – the answer, which is correct, has been cancelled, but there is no additional or surplus answer, therefore the candidate may be awarded 4 marks.

lignin, ~~chitin~~ - there is a surplus answer, which is incorrect, but it has been cancelled and as the candidate has given more than one answer (i.e. the candidate is answering the question more than once only), the cancelling can be accepted and he/she may be awarded 4 marks.

Question: Name the **four** elements that are always present in protein

Marking Scheme; carbon/ hydrogen/ oxygen/ nitrogen **4(3)**

Sample answers:

- carbon/ hydrogen/ oxygen/ nitrogen/ calcium – there is a surplus answer, which is incorrect, and which cancels one of the correct answers, therefore the candidate is awarded **3(3)** marks.
- carbon/ hydrogen/ oxygen/ calcium – there is no surplus answer, there are three correct answers, therefore the candidate is awarded **3(3)** marks.
- carbon/ hydrogen/ oxygen/ calcium/ aluminium – there is a surplus answer, which is incorrect, and which cancels one of the three correct answers, therefore the candidate is awarded **2(3)** marks.
- carbon/ hydrogen/ oxygen/ calcium / ~~aluminium~~ – there is a surplus answer, which is incorrect, but as the candidate has given more than one answer (i.e. the candidate is answering the question more than once only), the cancelling can be accepted and there is no longer a surplus answer and he/she may be awarded **3(3)** marks.

In the other sections of the paper, there are occasions where a correct answer is nullified by the addition of an incorrect answer. This happens when the correct answer is a specific word or term and it is indicated on the scheme by an asterisk *.

Conventions

- Each word or phrase for which marks are allocated is separated by a solidus (/) from the next word or phrase.
- The mark awarded for an answer appears in bold next to the answer.
- Where there are several parts in the answer to a question, the mark awarded for each part appears in brackets e.g. **5 (4)** means that there are five parts to the answer, each part allocated 4 marks.
- The answers to subsections of a question may not necessarily be allocated a specific mark; e.g. there may be six parts to a question – (a), (b), (c), (d), (e), (f) and a total of 20 marks allocated to the question. The marking scheme might be as follows – **2 (4) + 4 (3)**. This means that the first two correct answers are awarded 4 marks each and each subsequent correct answer is awarded 3 marks each.
- A word that appears in brackets is not a requirement of the answer, but is merely used to contextualise the answer.
- Square brackets are used where the Assistant Examiner's attention is being drawn to an instruction relating to the answer or to some qualification of the answer.

Section A. any five questions **5(20)**

Q 1.

any five 2(7) + 3(2)

- (a) respiration **or** digestion **or** deamination **or** other correct process **or** named stage **or** example of chemical reaction (word or equation)
- (b) photosynthesis **or** protein synthesis **or** replication **or** other correct process **or** named stage **or** example of chemical reaction (word or equation)
- (c) Vitamin A **or** D **or** E **or** K **or** chemical name
- (d) glucose **or** maltose **or** other correct sugar
- (e) cellulose **or** starch **or** other correct polysaccharide
- (f) iron **or** copper **or** zinc

Q 2.

- (a) feeding level **or** energy level **or** position in food chain **5**
- (b) name A + B **3**
C = parasite **or** scavenger **or** decomposer **or** correctly named **2**
- (c) A **5**
- (d) (producer) larger **or** consumer smaller **5**

Q 3.

- (a) A = chromosome [accept chromatid] B = centromere C = spindle **3(2)**
- (b) *Stage:* metaphase **2**
Reason: chromosomes on equator **3**
- (c) four **3**
- (d) comment on inheritance e.g. to carry genes, genetic code, code for protein **3**
- (e) to produce gametes **or** to reduce **or** to halve chromosome number [*allow* variation] **3**

Q 4.

2(5) + 5(2)

- (a) oestrogen **or** progesterone **3**
- (b) ovulation **or** described **3**
- (c) (i) pituitary **3**
(ii) production **or** development of follicle (egg) **or** (stimulate) oestrogen production **3**
- (d) B **3**
- (e) curve descending [days 1 – 5, *allow* up to day 9] **3**
curve ascending [after day 5] **2**

Q 5. (a) gene on sex chromosome **or** on X **or** on Y 2
 (b)

Parents: XY 2

Gametes: $\begin{array}{c} | \\ c \end{array}$ $\begin{array}{c} | \\ \end{array}$ **X** $\begin{array}{c} | \\ c \end{array}$ $\begin{array}{c} | \\ c \end{array}$ 2 + 2

F1 $\begin{array}{c} | \\ c \end{array}$ $\begin{array}{c} | \\ \end{array}$ $\begin{array}{c} | \\ c \end{array}$ $\begin{array}{c} | \\ \end{array}$ 2 + 2

Phenotype:

| | | | | | |
|---------|---------------------|-----------------------------------|---------------------|---------------|------|
| Sex: | <u>Female</u> | <u>Female</u> | <u>Male</u> | <u>Male</u> | |
| Vision: | <u>Colour blind</u> | <u>Normal</u> [accept carrier] | <u>Colour blind</u> | <u>Normal</u> | 4(2) |

Q 6. (a) xylem 2
 (b) A = vessel B = tracheid 2(6)
 (c) lignin 2
 (d) vascular bundle **or** next to phloem 2
 (e) phloem [*allow* animal example] 2

Section B*any two questions 2(30)*

- Q 7.** (a) (i) biological or organic or metabolic or protein catalyst **or** explained 3
(ii) keratin **or** myosin **or** other correct 3
- (b) (i) name of enzyme 3
(ii) name of matching substrate 3
(iii) pH **or** substrate concentration **or** enzyme concentration [*allow* amount] 3
(iv) buffer **or** same volume **or** same amount 3
(v) water baths **or** described **or** water bath at different temperatures **or** described 3
(vi) time / change e.g. colour, foam, etc **or** data logger / sensor named 2(3)
(vii) activity varies with temperature **or** reference to activity at a particular temperature 3
- Q 8.** (a) (i) *Rhizopus* **or** other 3
(ii) multicellular **or** mode of reproduction **or** size **or** structure 3
- (b) (i) material [or described] supplying food **or** material allowing growth 3
(ii) (malt) agar 3
(iii) free of (micro)organisms 3
(iv) cut leaves / attach to lid / how attached / sealed dish / invert / incubate / any aseptic technique / control described 4(3)
(v) pink (colonies) **or** if negative, result must be qualified 3
- Q 9.** (a) (i) supplies carbon **or** correct comment related to CO₂ 3
(ii) supplies hydrogen **or** protons (H⁺) or electrons **or** photolysis or described 3
[allow formation of carbohydrate or named once]
- (b) (i) *Elodea* **or** other correctly named aquatic plant 3
(ii) lamp distance **or** wattage **or** quantity of NaHCO₃ 3
(iii) carbon dioxide **or** light **or** temperature 3
(iv) water bath **or** described **or** lamp distance **or** wattage **or** NaHCO₃ 3
(v) bubbles or volume / time **or** data logger / sensor named 2(3)
(vi) vertical axis labelled rate + horizontal axis labelled [light **or** CO₂] 3
curve matching axes labels 3

Section C*any four questions 4(60)*

- Q 10.**
- (a) (i) 1. adenine* 2(3)
2. guanine* 3
(ii) hydrogen (bonding) 3
- (b) (i) examining DNA / for a pattern or band / to compare 2(3)
(ii) DNA extracted **or** explained / DNA cut into fragments / using enzymes / fragments separated / on basis of size / pattern analysed 4(3)
(iii) forensic science or explained / relationships or explained / medical or explained 2(3)
(iv) to establish presence **or** absence of gene(s) 3
- (c) (i) chromosome contains DNA 3
mitosis maintains same chromosome number **or** cells derived from mitotic division 3
(ii) gamete **or** sex cell or named 3
(iii) chop plant into small pieces / add salt / add detergent / warm to 50 – 60 degrees / then cool / blend / any one correct time point / filter / add protease / add cold ethanol 5(3)
- Q 11.**
- (a) (i) Adenosine Triphosphate 3
(ii) stores **or** provides **or** described / energy 2(3)
- (b) (i) glycolysis* 3
(ii) cytoplasm* **or** cytosol 3
(iii) pyruvate* **or** pyruvic acid 3
(iv) no* 3
(v) lactic acid **or** ethanol 3
(vi) (begins with) acetyl co-enzyme A / Krebs cycle / release of carbon dioxide / H release / transport system / ATP formed / O₂ required / H₂O produced 4(3)
- (c) (i) attached **or** fixed **or** trapped / how or explained 2(3)
(ii) (calcium or sodium) alginate or other correct 3
(iii) enzyme can be reused / can be recovered / pure product / comment on cost **or** efficiency **or** stability **or** longer lasting 2(3)
(iv) enzyme name [*allow yeast*] 3
matching substrate name 3
matching product name **or** application 3

- Q 12.** (a) *niche*: – role of organism **or** explained 3
edaphic factor: – soil factor 3
symbiosis: – (close) relationship between two species involving benefit 3
- (b) (i) to make (nitrogen) available or described / for use by organisms or described 2(3)
(ii) N₂ converted to compound **or** named 3
(iii) ammonia to nitrites or to nitrates **or** nitrites to nitrates 3
(iv) fixation / lightning / plant protein / animal protein / death **or** excretion / decomposition / ammonia produced / ammonia to nitrites / one role of bacteria / denitrification **or** explained 5(3)
- (c) (i) predator* 3
(ii) prey* 3
(iii) starvation **or** death / migration / decline in population / change food source / [allow increased competition] 2(3)
(iv) famine or food availability / birth control / war / disease / birth rate / death rate **or** longevity / degree of medical care / natural disaster or example 4(3)
- Q 13.** (a) (i) pulmonary vein* 3
(ii) oxygen* 3
by (oxy)haemoglobin **or** by iron 3
- (b) (i) diagram [trachea, bronchus, alveoli, diaphragm or ribs] 6, 3, 0
[any one missing 3 marks]
labels [trachea, bronchus, lung] 3(1)
(ii) *epiglottis*: to close off trachea or described 3
larynx: to make sound 3
(iii) diaphragm contracts / lowers / intercostal muscles contract / rib cage up / #volume of chest (cavity) increased / #decreased pressure / air in / to equalise pressure #2(3)
[# points compulsory] 2(3)
- (c) (i) capillary network / moist surface / thin walled / elastic wall [allow large surface area **or** one cell thick **or** thin membrane] 3(3)
(ii) diffusion **or** passive transport 3
(iii) asthma **or** bronchitis 3
(iv) 1. cause: 3
2. prevention: 3
3. treatment: 3

Q 14. Any two of (a), (b) or (c).

- | | | | |
|------------|--------------|--|----------------------------|
| (a) | (i) | ovule* | 3 |
| | (ii) | cotyledon / endosperm | 2(3) |
| | (iii) | radicle / plumule develops root / develops shoot | 2(3) 2(3) |
| | (iv) | when it does not germinate (despite favourable conditions) or period of low metabolism or explained | 3 |
| | (v) | germination at suitable time / time for embryo to develop / survival of plant during unfavourable conditions / increased dispersal | 2(3) |
| (b) | (i) | obligate parasite or explained / non-cellular / can be crystallised / no metabolism / one nucleic acid | 2(3) |
| | (ii) | DNA or RNA or nucleic acid / protein | 2(3) |
| | (iii) | smallpox / chicken pox / measles / polio / 'flu / common cold / leaf mosaic / others [<i>allow</i> AIDS or HIV] | 2(3) |
| | (iv) | bacteriophage or used in genetic engineering or vaccine production or vector (in disease treatment) | 3 |
| | (v) | substance produced by micro-organisms / that kills (some) micro-organisms or bacteria or fungi | 2(3) |
| | (vi) | (antibiotics) have no effect (on viruses) or promote resistant bacteria | 3 |
| (c) | (i) | resistance to infection or to antigens [<i>allow</i> disease] | 3 |
| | (ii) | recognition / produce antibodies / specific to antigens or in response to antigens [<i>allow</i> memory cells] | 2(3) |
| | (iii) | <i>active immunity:</i> body produces antibodies | 3 |
| | | <i>passive immunity:</i> antibodies introduced to body | 3 |
| | (iv) | vaccination introduces antigen or explained / causes antibody production | 2(3) |
| | (v) | 1. passive* | 3 |
| | | 2. infection may already have occurred or possibility of dangerous infection or example or no vaccine available or vaccine too expensive | 3 |
| | | 3. short | 3 |

Q 15. Any two of (a), (b) or (c).

- (a) (i) diagram [penis, urethra, sperm duct, testis] 6, 3, 0
labels 6(1)
(ii) X on testis 3
(iii) Y on epididymis 3
(iv) growth / development of primary sex characteristics or example / development of secondary sex characteristics or example / sperm production / comment on male behaviour 2(3)
(v) low sperm count **or** low sperm motility **or** hormonal imbalance or explained **or** named chemical **or** smoking **or** drug abuse **or** erectile dysfunction [*accept* unsuitable temperature (of testes) or cause described] 3
corrective measure matched 3

- (b) (i) ductless or secretes into blood stream 3
(ii) chemical transmission / slower action / longer lasting effect / many target organs 2(3)

(iii)

| Endocrine Gland | Location | Hormone | Role of Hormone |
|----------------------|-------------------|--------------|---|
| Islets of Langerhans | | | regulates blood sugar or explained |
| | neck or described | thyroxine | growth in young or (rate of) metabolism |
| adrenal | on kidney | adrenalin(e) | |

8(2)

- (iv) *Named hormone:* 1
1. *deficiency symptom:* 2
2. *corrective measure:* 2

- (c) (i) *Homeostasis:* maintenance / of constant internal environment or two named factors constant 2(3)
Reason: allows normal metabolic activities or example **or** keeps temperature suitable for enzyme reactions 3

- (ii) diagram [top layer, hair follicle or sweat gland + 1 other] 3, 0
labels [sweat gland, hair, arteriole, fat] 2+1
[allow temperature receptor]

- (iii) temperature drop / hair erects / traps air as insulator [or opposite] **or** temperature drop / arteriole constricts / keeps heat [or opposite] **or** temperature rises / sweat produced / sweat evaporates causing cooling **or** fat / insulates / from outside or inside 3(3)

- (iv) body temperature varies / with environmental temperature 2(3)
[allow 'cold-blooded' or explained for 3 marks]

